THE ANACONDA COMPANY
GREAT FALLS REDUCTION DEPARTMENT
GREAT FALLS, MONTANA

MEMORANDUM

INDUSTRIAL HYGIENE DEPARTMENT — May 1, 1972

TO: W. J. Roberts
Manager

FROM: W. E. Gray
Industrial Hygiene Engineer

SUBJECT: ENVIRONMENTAL INFORMATION CONCERNING THE EAST HELENA OPERATION REQUIRED FOR MR. DON GOODWIN, DIRECTOR STANDARDS DEVELOPMENT AND IMPLEMENTATION DIVISION AS REQUESTED BY MR. FRANK LAIRD, JR.

1. Firm Name

The Anaconda Company
East Helena Slag Treatment Plant
East Helena, Montana

2. Plant Location

East Helena, Montana

3. Person to Contact Regarding This Report

Mr. W. J. Roberts, Manager

4. Phone Number

406-227-6721

5. Operating Schedule

(a)	hours/day	24
(b)	days/week	7
(c)	weeks/year	50

6. Type, quantity and average sulfur content of each raw material processed, reported by operation.

1970	Hot Slag	184,379 Tons @ 1.5% Sulfur	1971	Hot Slag	138,668 Tons @ 1.5% Sulfur
	Cold Slag	47,946 Tons @ 1.3% Sulfur		Cold Slag	39,986 Tons @ 1.3% Sulfur

7. Type and quantity of each finished product

1970	Zinc Fume	42,588 Tons	1971	31,237 Tons

8. Type and operating efficiency of any air pollution control equipment, reported by operation

Baghouse for Fume Collection - Efficiency 99+%
Baghouse for Coal Pulverizer - Efficiency 99+%

9. Location of emission points, including estimate of leakage emissions at "ground level", by Universal Transverse Mercator (UTM) coordinates, or equivalents

Emission Points Relative to the N.E. Cor. SEC. 36 Twp 10 N Range 3W

Montana Principal Meridian
1. Baghouse S. 830' W. 1795'
2. Furnace Bld. S. 1420' W. 1250'
3. Coal Bld.

10. Stack data by operation, including height above grade, inside diameter at top, and exit gas temperature and velocity

1. Furnace Charge-Tap Area Stack
   (a) Height above grade 60'
   (b) Inside Diameter 30"
   (c) Exit Gas Temp. 70°F -108°F
   (d) Velocity 7940 AFM

2. Furnace Tapping Launder Stack
   (a) Height above grade 60'
   (b) Inside Diameter 18"
   (c) Exit Gas Temp. 170°F
   (d) Velocity 5940 AFM

11. Type and quantity of each air pollutant emitted and basis of estimate

1. Baghouse
   (a) SO_2 1420 Tons/Year

2. Furnace Charge-Tap Area Stack (Stack Sampling)
   (a) Particulate
      1. Tapping .05 - .09 grains/ACF @ 35,500 ACFM
      2. Charging 0.105-0.11 grains/ACF @ 39,000 ACFM

(b) SO_2
1. Tapping 60 ppm
2. Charging 0 - 30 ppm

3. Furnace Tapping Launder Stack
(a) Particulate
1. Tapping 0.26 grains/ACF
@ 10,500 ACFM

12. Type of fuel used and amount per year (Show amounts separately for processes, space heating, and power generation.) Identify percent sulfur for each fuel and percent ash for coal

1970	Coal	47,321 Tons	1971	Coal	35,239 Tons
		@ .68% Sulfur			@ .68% Sulfur
	Natural Gas	2,980,170 Cu.Ft.		Natural Gas	2,337,470 Cu.Ft.
		Sulfur Content-NONE			Sulfur Content-NONE

13. Size, type, and number of boilers in operation

Boiler 1 - Size 48" x 54" Type K.F.B.

14. Map showing the plant property boundaries and locations of various operations

ATTACHED

15. Ambient air quality data for sulfur dioxide obtained using company sampling instrumentation

Company does not sample for ambient SO_2

East Helena

Grab Fume Sample

Gt. Falls Composite Settlement Sample

Lot No.	Car No.	Dry Weight	% Zn	% Pb	No. of Cars	% Zn	% Pb
148	73643	86622					
149	73452	84455	72.0	5.2			
150	73321	109220					
151	73377	79,186					
152	73492	79,740	70.8	5.9	23	69.1	7.1
153	73586	88,520					
155	73419	92,786	70.6	6.7			
156	73666	85764	70.6	6.7			
159	73239	81135	69.1	7.4	3	68.7	7.4
160	70478	80756					
161	73415	83929					
162	73234	88566					
163	73426	85340	71.7	7.8			
164	73200	82920			8	68.9	8.0
165	73360	76671					
166	73241	84200					
168	73238	89000	69.7	7.8			
169	73358	88620					
167	73617	82048	69.7	7.8			
170	73698	88120					
171	73330	89480					
172	73309	95720	70.3	7.0			
173	73372	94520					
174	73597	90240					
175	73460	91640	71.0	7.2			
176	73461	88940					
177	73308	69740					
179	73239	92320	71.0	6.0	19	69.8	7.2
180	73428	89386					
181	73373	87967					
182	73219	88398					
183	73572	87125	71.6	6.5			
184	73507	74185					
185	73519	66499					
186	73286	95900					
187	73220	82010	69.4	6.8			
188	73633	77180					
189	73315	105680	69.6	6.8			
190	73299	87260					
191	70478	82200					
193	73656	89200					
194	73247	83840	70.2	6.8			
195	73607	79080					
198	73321	85860	71.5	6.0			
199	73239	84420			19	69.8	7.2
200	73643	88020	71.6	6.4			
201	73213	90980					
204	73550	82455					
205	73666	88580					
206	73415	89211	70.2	6.0			
207	73515	98037					
208	73229	89991					
209	73621	87360					

Comparing these analyses with those made from the input stock they are close to what would be expected from the removal of moisture only. The volatile matter on the moisture free basis from samples before and after drying remains almost the same. Therefore it can be said that the drying did not remove any appreciable volatiles from the coal. There is a difference of about one percent in the moisture content as determined by ASTM standards in the laboratory from those determined as a control of the drying. The ASTM determinations for these cars are about 1% less than the control moisture determination. The ASTM moisture determination is made with the temperature controlled at 221 F for one hour with the sample being ground to pass a 60 mesh sieve. The control moisture determinations were made on the unground sample, but the temperature and time elements were the same as the ASTM procedure. The discrepancy between the moisture determinations may become explainable when more samples are analyzed.

OBSERVATIONS OF DRIED COAL PILES AT THE MINE.

From each days run a truck load, about 1-2 tons of coal was dumped in a pile for observation. Temperatures were taken daily of the coal in the pile with a dial thermometer with an 8" probe. The thermometer was inserted in the pile so that the sensing part was about 12" in the pile. The coal retained its latent heat for several days, and at this writing still shows a temperature of around 120 which is 10 to 12 days after being dried. The pile from the first day's run fired at the N.W. edge the second day after being piled. This was right near the ground level. The ground on which the piles were dumped was quite damp from recent precipitation and this probably contributed to the firing. In an effort to arrive at a conclusion whether the heat in the coal was latent or caused by a slow oxidation, a cream can was filled with the product, covered, and a thermometer thrust into the contents so as to sense temperature changes at the center of the mass. The attached Time-Temperature curve visualizes the results. The coal was put in the can at 130 F. and after six hours began a steady temperature loss, the gradient being practically a straight line for the next 22 hours and then gradually curves down to room temperature which was reached after about 60 hours. One can draw the conclusion that this behavior indicates there is no appreciable combustion contributing to the heat in the coal. The coal holds its heat for a very long time, it is a good insulator. A car load of the product which was shipped to the Montana Dakota Utilities at Acme was periodically checked for temperature. After the car, a closed hopper, # 180220 the last one loaded, had stood for ten days the coal about a foot from the surface still had a temperature of 150 F.

It is planned to infiltrate the coal in the cream can with oxygen and then observe any temperature changes that are evidenced. This may give some insight into the oxidization tendency of the coal.

OBSERVATIONS OF THE COAL AT DESTINATION.

The shipment traveled by rail about 300 miles to its destination and CARS were observed there about five days after loading. Some of the cars had water dripping out of the doors at the bottom and the sides of the car felt about as cold as the ambient temperature. Apparently there is moisture extraction process going on in the cars for a few days after loading. The coal being at a temperature above that of boiling water continues to give off moisture, especially that portion near the surface of the mass. The sides and top of the car being cool and losing heat, condenses the moisture which then percolates through the coal near the outside and finally finds its way to the cracks in the door at the bottom. In the car which was dumped at the MDU power plant it was noted that the sides of the cars were slightly encrusted with damp coal adhering to the sides.

ANACONDA COPPER MINING COMPANY
Slag Treating Plant - East Helena, Montana

February 28, 1936

Mr. Alexander Laist, Supt.
Slag Treating Plant,
East Helena, Montana.

Dear Mr. Laist:

In December 1933 the slag treatment furnace at East Helena was lengthened three feet by the addition of one water jacket. This additional jacket enlarged the hearth area of the furnace 25% and has been the big contributing factor to our past successful operation. With the larger furnace we began at once to increase the tonnage treated per charge and per day until we are now treating a full 25% more slag than it was possible to handle in the original furnace. At the same time a higher percentage of the zinc from the slag has been recovered and the general efficiency of the plant as a whole has been greatly improved. This expansion was accomplished with a very small increase in operating expense. Although we increased the amount of slag treated by 25%, it was only necessary to increase the amount of coal going to the furnace by 5%. The only other extra expense was for more air volume and for additional slag to treat. We have used more air for melting slag, but are reducing the charge with less air than was used in the small furnace. The result is only a small increase in air consumption.

Below is shown the tons of coal consumed before and after enlarging the furnace. I have considered only periods when two blast furnaces were in operation by the A.S.& R.Co.

Before Enlarging
Furnace size, 8' x 12'
Coal Used, Bear Creek
Coal Screw R.P.M., 135 to 160

Tons Coal Used

Month	Year	Days Opr.	Total Tons	Daily Av.
Sept.	1933	30	2907	96.9
Oct.	1933	28	2710	96.8
Nov.	1933	30	2998	99.9
Dec.	1933	18	1776	98.7
Average		106	10391	98.0

After Enlarging
Furnace size, 8' x 15'
Coal Used, Bear Creek
Coal Screw R.P.M., 140 to 170

Tons Coal Used

Month	Year	Days Opr.	Total Tons	Daily Av.
Feb.	1934	27	2775	102.8
Apr.	1934	15	1520	101.3
May	1934	11	1113	101.2
Dec.	1934	16	1636	102.2
Feb.	1935	28	2813	100.5
Apr.	1935	29	3084	106.3
July	1935	17	1688	99.3
Sept. &Oct.	1935	33	3465	105.0
Average		176	18094	102.8

Percent increase in coal consumption for 25% larger furnace = 4.67%.

We have finally reached capacity operation with the present size furnace (8' x 15'). In January 1936 we treated 12234 tons of slag, a record to date. The first 10 days of February 1936 we averaged 403 tons of slag per day. With two lead blast furnaces in operation about 20% of the charge

is composed of slag mined from the A.S.& R. dump. At present we are treating 49 to 50 tons to a charge and are blowing 8 to 9 charges per 24 hours. We cannot expect to treat any more to a charge, neither can we shorten the blowing time and gain in zinc production. The only solution for further advancement is to again enlarge the furnace and thus make possible the treatment of larger tonnage by mining more slag from the dump.

There is practically an inexhaustable supply of good grade slag on the A.S.& R. dump. Mr. Chisholm, the general superintendent of the A.S.& R. plant, has kindly furnished me the following figures on their slag production.

Period	Tons Slag Produced	Zinc Assay
April, 1916	7612	10.0
May, "	7526	9.8
June, "	10545	9.8
July, "	9620	9.6
Aug. "	5186	8.6
Sept., 1916 to March, 1917	less than	8.5%
March, 1917	8158	9.3
April, "	7930	8.7
May, "	8650	8.6
June, "	8988	9.2
July "	10567	8.9
Aug. "	9231	9.4
Sept. "	11387	8.8
Oct.,1917 to March, 1918	less than	8.0%
March, 1918	4592	8.9
April, "	5552	10.4
May, "	6042	12.5
June, "	5147	12.5
July, "	5254	13.1
Aug. "	4910	12.4
Sept. "	6570	11.0
Oct. "	9458	9.8
Nov. "	8328	9.8
Dec. "	11550	10.7
Year, 1919	78867	9.5
" 1920	120410	7.5
" 1921	152455	8.5
" 1922	156173	9.9
" 1923	177267	11.5
" 1924	198942	12.5
" 1925	198645	11.8
" 1926	198129	12.5
" 1927	164494	13.0

Slag Plant received first hot slag in December 1927

Slag Plant's mining operation started December 18, 1930.
Amount of slag mined and treated up to January 1, 1936,
89618 tons

Considering only the last six years shown above, 1922 to 1927, inclusive, there are 1,093,650 tons of slag available which average 11.9% zinc. The remainder of the slag produced since April 1916 would average high enough in zinc to make treatment of this slag very profitable in the slag furnace. In fact, we have been treating this lower grade material in the furnace the last few months and have realized an excellent profit on it.

Our operation now warrants consideration of the addition of two more jackets or six feet to the length of the furnace, which would enlarge the hearth area 40% and would make room for a charge as large as 70 tons. However, until the supply of hot slag increases, it probably would not be desirable to treat more than 60 tons to a charge. Assuming a 10 ton increase in slag treated per charge, the daily tonnage would be 80 to 90 tons more than we now treat or an average of approximately 480 tons per day. The extra slag would, of course, come from the slag mine. This 40% larger furnace would also make it possible to treat all the slag produced by three blast furnaces and recover about 85% of the zinc. To handle a three-furnace production of slag without a larger furnace would be difficult and could be done only by using shorter blows which would result in tails too high for efficient operation.

It should be noted that a 40% increase in the size of the furnace does not mean that the air and coal must be increased 40% to insure the most efficient operation of the furnace. We have had actual experience in the amount of coal and air increase necessary for a given increase in furnace size as pointed out in the first part of this letter. Since a 25% increase in furnace size and tonnage treated required only 4.67% more coal it is logical and safe to assume that the coal will be increased in nearly the same proportion for any additional enlargement of the furnace. In other words, there would be required about 10% more coal than is now burned, or about 113 to 115 tons per 24 hours. This assumption is further strengthened by the fact that the Trail Plant uses about 120 tons of coal per 24 hours to operate their slag furnace which is 8 x 24 feet, 3 feet longer than our proposed plan. To deliver 115 tons of coal in 24 hours time our coal screws would average approximately 167 R.P.M. as compared with about 152 R.P.M. which they now average. The screws will have to run much faster than shown by the average, however, as more coal is used for reducing a charge than is used to melt it.

We are now using 100% of the Nordberg Compressor or 12000 cubic feet of air per minute during the charging of the furnace. The charges are usually reduced on 72% or 8640 cubic feet per minute. To charge a larger furnace properly, greater compressor capacity would be required. It would be good business to have another compressor whether or not the furnace is made larger. Much lost time has resulted from Nordberg trouble, as any breakdown on this machine shuts down the entire plant. If the purchase of a new compressor is considered, it should be of sufficient capacity to insure continuous operation of the furnace. An additional unit of 6000 cubic feet would not be satisfactory because any little breakdown on the larger machine would still leave the furnace without sufficient air volume with which to operate. We did manage to run for a few days on one cylinder of the Nordberg by using a small tonnage of liquid slag in the present furnace, but the air on the tuyeres was so low that coal tended to blow back when the tuyeres were punched. If this 6000 cubic feet of air were distributed over 12 more tuyeres, as it would be in the larger furnace, I am quite certain that operation would be impossible.

Enough compressor capacity should be available so that if either machine were down for repairs, the other could continue to operate the furnace. We could run continuously with an additional compressor of 9000 cubic feet capacity, but a duplication of the machine we now have would be ideal. In the latter case, one machine could be shut down completely for any length of time without interfering with the operation in any way. The only way a unit of 6000 cubic feet could be successful in our case would be to alter the machine we now have so that either half of the compressor could be cut out and shut down for repairs without affecting the other side and without stopping the machine. If the machine had to be stopped for a cylinder to be disconnected by removing the connecting rod, it would be necessary to tap the furnace out and hours would be required to get back to normal operation. If money is allowed for a compressor, it would be better to spend whatever more is necessary to get one large enough to do away with these difficulties. A large amount of money would be saved if we could eliminate the many forced tap-outs and lost time resulting from break-downs on the Nordberg.

A few other changes to the plant and additional machines would be necessary if the furnace is enlarged. There should be another unit built on the baghouse in order to lower the pressure that the fan now works against. Our baghouse has always been too small. During the day shift when fume is loaded it is necessary to have one of the four units closed most of the time. With only three units in operation there is not sufficient filtering area and the furnace and flue smoke as a result. This smoke from the furnace is harmful and dangerous to the men as shown by our several cases of carbon monoxide poisoning. Another coal mill would also be necessary to grind the extra coal that the furnace would require. This is another machine that should be duplicated, as a break-down on the pulverizer means the furnace must shut down within a few hours due to the supply of fuel running out. Perhaps the most important change to be considered is that of raising the water-cooled flue the limit that space will allow. It has always been necessary to have a wall about five feet in height built in the throat of the furnace to prevent slag splashing into the water-cooled flue. This wall greatly restricts the opening through which the furnace gases must pass and forces the furnace to work against considerable pressure. Our smoke hazard is, therefore, much greater than it should be. Also, about 15 minutes each day are lost in barring down slag and ash accummulations which tend to collect on the wall. In addition there is urgent need for another coal feeder. There are four feeders in operation and one spare; however, when repairs are being made on any one feeder, we are forced to fill the others with only three screws running. The furnace is then short of coal for about 40 minutes to a charge and the tail on that charge is always very high.

Following are some figures to show what results could be obtained from a normal day's operation by making the furnace two jackets longer.

Furnace size, 8 ft. x 21 ft.
Hot slag production, 10,000 tons per month = 333 tons per day.
Tons slag treated, 8 charges of 60 tons each, or 480 tons per 24 hours, 147 tons being dump slag.
Average heads, 11.00% zinc
Average tails, 2.00% zinc
Average elimination, 83.6% zinc.

Tons zinc charged,	52.80
Tons zinc tapped,	8.63
Tons zinc recovered,	44.17

Revenue at 4.90¢ zinc market when Great Falls allows us 2.73¢ per lb. zinc,	$ 2411.68
Estimated Operating Expense	1200.00
Operating profit	$ 1211.68

Increased profit due to furnace enlargement, approx. $300 per day.

The estimated operating expenses were arrived at as follows:

Average expenses per day for Jan. 1936	$ 1065.00
Additional slag, 80 tons at 35¢ per ton	28.00
Cost of mining above slag at 23¢ per ton	18.40
Additional coal, 15 tons at $3.11 per ton	46.65
Additional air, etc.	41.95
Total -	$ 1200.00

Although we are considering only a 40% enlargement of the furnace at present, the past treatment of dump slag has been so successful and the quantity available is so great that I wish to show below the possibilities for a two unit plant. By a two unit plant I mean a duplication of our furnace, flue system, and baghouse with the necessary equipment to operate them.

We have had sufficient experience operating with only one A.S.& R. furnace producing slag to eliminate any guess work whatsoever about the results that could be obtained, for the reason that each of the units would operate exactly as the plant now operates when the smelter is down to one furnace. Each slag furnace would receive and treat the slag produced from one blast furnace plus the required tonnage of slag from the dump. The profits from the second unit, however, would be considerably greater than we have shown for one-furnace operation in the past due to lower over-head expenses. The following example for Unit No. 1 is taken from actual operation and is representative of our work when using high quality Roundup Coal.

Two Unit Operation

Both furnaces same size as now used, 8' x 15'
A.S.& R. slag production, 10,000 tons per month
Each unit receives 5,000 tons per month or 166 tons per day
Mine slag treated, 170 tons per unit
Total tons treated per furnace, 7 charges of 48 tons each or 336 tons
Average heads, 11.00% zinc
Average tails, 1.80% zinc
Combined total tonnage treated per day, 672 tons

Unit No. I		Unit No. II	
Tons zinc charged,	36.96	Same as for Unit No. I	
Tons zinc tapped,	5.45	except expenses are less.	
Tons zinc recovered,	31.51		
Revenue at 4.90¢ market,	$1720.45	Revenue,	$1720.45
Operating expenses,	1000.00	Expenses,	825.00
Operating profit,	$ 720.45	Profit,	$ 895.45

Total zinc recovered from 2 units, 63.02 tons.
Total combined daily profit from 2 units, $1615.90

In the following examples I have assumed the addition of one jacket to our present furnace and a duplicate plant of the same size. Both furnaces are 8' x 18' and treat 55 tons to a charge.

Unit No. I		Unit No. II	
Hot slag charged,	166 tons	Hot slag charged,	166 tons
Dump slag charged,	219 tons	Dump slag charged,	219 tons
Total treated,	385 tons	Total treated,	385 tons
Zinc charged,	42.35 tons	Same as for Unit No. I except expenses are less.	
Zinc tapped,	6.59 tons		
Zinc recovered,	35.76 tons		
Revenue at 4.90¢ market,	$1952.50	Revenue,	$1952.50
Operating expenses	1050.00	Expenses,	875.00
Profit	$ 902.50	Profit,	$1077.50

Total zinc recovered from 2 units, 71.52 tons per day.
Total combined profit from 2 units, $1980.00 per day.

Perhaps the company is not interested at present in investing capital in a new unit for the East Helena plant. However, it should be kept in mind that there is a large "zinc mine" right at our front door and that the reclaiming of this zinc is a profitable business in the slag furnace. Furthermore, that the greater the tonnage mined and treated, the higher will be the profits from this operation.

The least that should be considered at this time is the 40% larger furnace which will allow an increase in the mining operation and make possible further improvement and advancement in the slag treatment department at East Helena.

Yours very truly,

R. L. Thompson

R. L. Thompson,
Metallurgist.

EAST HELENA PLANT

August 25, 1959

Mr. S. M. Lane, Manager
PRESENT

SURVEY OF SLAG DUMP

The Anaconda slag dump was surveyed during the period August 4-7, 1959. The outline of this dump is shown on the map, Drawing No. 3469. The slag reclaiming area was also surveyed and plotted. The A.S.&R. Company slag dump is still essentially as shown on Drawing No. 3866 "Topographic Map of A.S.&R. Co. Slag Dump". The changes in the A.S.&R. Company dump due to slag reclaiming are shown on the map, Drawing No. 3469.

Personnel of the Anaconda Company state that they are dumping slag at a rate of 151,700 tons per year. About 40-45 percent of this slag is reclaimed slag. They find from their records that from 1927 thru the first week of August 1959 that a total of 4,233,729 tons of slag have been dumped.

The slag weighs about 206 lbs/cu.ft. Therefore, one cubic yard would weigh about 2.78 tons.

Slag volumes as listed were computed as closely as possible as well as the approximate time it will take to fill these spaces:

	Cu. Yds.	Tons	Yrs. to Fill
1. Volume of Anaconda Co. dump as of Aug. 1959	1,500,000	4,170,000	
2. Volume removed from slag reclaiming area	120,000	333,600	2.2
3. Volume available for dumping on N.W. end of Anaconda dump w/o removing ball park	230,000	639,400	4.2
4. Add. volume available if ball park removed	300,000	834,000	5.5
5. Volume available if height of existing dump were increased to present max. height over full area of dump	265,000	736,700	4.8

The slag reclaiming area will be considerably larger by the time the present area to the North and West of the dump is filled and will contain more than 2.2 years dumping at that time.

It is possible to build the height of the dump to considerably more than its present maximum if Diesel locomotives are substituted for the present electric locomotives.

It seems that from our standpoint, the best solution would be to endeavor to interest the Anaconda Company in increasing the height of the dump when the present available area is filled.

Lyle F. Clow

LYLE F. CLOW

cc: KDLoughridge

For A.S.&R. Co. Plant Records

F. 88-10-68-7-57-5194

THE ANACONDA COMPANY

SLAG TREATING PLANT—EAST HELENA

Daily Report DECEMBER 4, 1957

FURNACE CHARGES

Charge Number	Tons Slag Hot	Tons Slag Cold	Minutes Lost Time	Minutes Charging	Minutes Per Charge	% Zinc in Table
3057	43	18	80	70	160	3.3
3058	46	0	0	90	180	1.6
3059	46	14	0	70	160	1.5
3060	37	24	0	60	175	2.3
3061	41	20	0	60	165	1.7
3062	41	19	0	70	165	1.8
3063	37	23	0	70	175	1.5
3064	42	18	0	65	165	1.7

COAL

Tons Used	% Used	Tons in Storage
114.7	24.5	469.00

FURNACE AIR

Avg. Volume Range—1000 CFM 10.8 to 12

Avg. Max. Pounds Pressure 9-1/4 to 10

	Tons	Hours	Percent Zinc in Slag Hot	Dump	Eliminated
Totals	469	80	555	1345	
Daily Avg.	58.6	---	---	168	1.93 / 16.25 / 18.2 / 11.5 / 90.1
Monthly Avg.	60.3	---	---	167	2.10 / 15.53 / - / - / 88.5

Tons Treated Hot Slag	Tons Treated Dump Slag	Tons to ASAR Dump Shells	Tons to ASAR Dump Liquid Slag	Percent of Shells in Slag Rec'd.	Percent of Shells Treated	Lbs. Zn Eliminated Per Min.	Lbs. Coal Used per Lb. Zn	Man Day Pay Employees Day	Man Day Pay Employees Avg. This Month
332.81	136.20	10.56	5.0	20.0	84.6	102.1	1.67	84.10	48.32

PURCHASE COST PER TON, THIS DAY

Hot Slag	Dump Slag
$ 5.08	$ 2.54

BRICK FLUE TEMPERATURES

	Avg.	High	Low
Hot end	2225	2280	2190
Cool end	1988	2080	1920

SHIPMENT OF PRODUCT—

To Be Shipped	Lot No.	Car Number	Net Weight	Shipped to
December 4	928	GN 73374	?	American Chemet Corporation, East Helena, Montana
December 4	930	GN 73695		Great Falls Reduction Department
December 4	931	GN 73292		ditto
December 4	932	GN 73512		ditto
December 4	933	GN 73484 (Crusher Fume)		ditto

REMARKS

Changing some water connections at the furnace and examination of the new fan at the baghouse after over a months run following extensive repairs caused a loss of 80 minutes. The fan was in very good condition with no sign of failure in the repair welds. One of the six blades was brushed clean and the fume collected and weighed. The collection weighed only five pounds which was much less than anticipated. Since the deposit appeared quite uniform, the six blades would carry approximately thirty pounds of dust.

Dust from balloon flues - East Helena
Shipments May 1943 - 8 cars (34 to 43 tons ea)
[illegible]9 tons total - [illegible] of which came from flues.
Balance from cooler hoppers.
4 shifts per week for [illegible] - cleaning flue.
2 men per day - 6 days per week - taking dust from bag house [illegible] flue.

Fume production June 1943 East Helena
2948 tons dry wt produced
3030.8 tons (wet) = 101 tons/day
82 cars = 36.9 tons/car
say 3 cars/day.

Samples of dust from E Helena

	Date	Lot	Pb	Zn	Insol	Fe	In.	Ge	F
Crusher	8/3	1069	1.7	65.8	5.3	3.1	.140	.002	03
[illegible] flue		70	5.2	69.4	0.8	0.4	.165	.005	.03
[illegible] tubes		71	[illegible]	[illegible]	[illegible]	[illegible]	.170	.005	.06
Baghouse		[illegible]	7.5	71.8	[illegible]	[illegible]	[illegible]	.006	.11

Rec'd [illegible]

THE ANACONDA COMPANY - SLAG TREATMENT PLANT
EAST HELENA, MONTANA

INTRODUCTION

My name is Martin K. Hannifan and I am the General Manager of Montana Operations for The Anaconda Company. The Slag Treatment Plant at East Helena is considered part of The Anaconda Company, Great Falls Reduction Department, and as such is an integral part of our zinc processing and refining cycle. This plant employs approximately 80 people and operates 3 shifts per day, 7 days per week.

OPERATION

Lead smelters, such as that of American Smelting and Refining Company in East Helena, treat various feed materials containing lead, zinc, and other elements including gold and silver. Zinc is the only major metal not recovered at their plant and it remains in the discarded slag. Anaconda purchases this discarded slag from ASARCo as feed material for our plant. We produce a zinc fume which is transported by railroad car to the Great Falls Refinery for further processing. A small amount of fume is sold to the nearby American Chemet Corporation.

Our fuming process, developed nearly forty years ago at East Helena, can be simply visualized as a straight line operation. Feed is charged into a singular furnace that is fueled with pulverized coal. The gaseous, vapor, and particulate emissions leaving the furnace enter a common flue wherein they are subsequently cooled and directed to a baghouse. All fume entering the baghouse is retained at greater than 99% efficiency. A low speed, high volume fan interposed in the system draws the gas stream from the furnace and blows it into the baghouse. Large quantities of fume fall out in the flue and cooler section and are removed by screw conveyors.

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Molten slag from ASARCo's smelter is delivered to our plant in ± 5-ton ladles. Approximately 50-tons of such slag is charged per furnace cycle. Cold slag, added either simultaneously or separately, is used to complete the furnace charge of 57-tons. The ratio of hot to cold slag varies with production in the lead smelter. Pulverized coal is blown into the furnace thru tuyeres located low in the furnace. Coal consumption varies with the slag mixture but usually ranges between 10-15 tons per charge. A furnace cycle is completed approximately every 2 hours (11-12 per day).

The molten slag ladles are elevated by overhead crane and the slag is poured into a singular charge hole near the top of the furnace. During this charging of hot slag, visible effluent is released to the atmosphere.

We received a Notice of Violation concerning this effluent on May 26, 1971. The Division of Air Pollution Control, Montana State Department of Health, cited us for being in violation of Regulation 90-007 - Restriction of Emission of Visible Air Contaminants. At the same time, the tapping operations of this furnace was similarly cited. Tapping occurs at the end of each furnace cycle or 11 times per 24-hours and seldom requires more than 10 minutes per time.

In May of 1971, The Anaconda Company initiated a program to control the emissions from this slag treating furnace. A special hood has been designed, fabricated and installed to adequately enclose the hot slag charge hole and still allow access for the crane operator to dump the ladle. Ductwork has been installed to

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connect this hood and the tapping area to an existing fan. We are awaiting delivery and installation of a new motor sheave to make this complete exhaust system operative from which finalized imput parameters can be determined. The system as now in place does not have installed retention equipment. We are confident that this exhaust system will adequately capture the emissions; however, precise displacement, as well as the character and chemistry of the particulates must be determined before ordering retention equipment. We estimate that collection requirements will be in the order of 40,000 cubic feet of air per minute requiring installation of a baghouse at a cost in excess of $100,000.

We are requesting a variance to continue operations for one year, during which time design parameters will be defined. Also, collection equipment will be installed if this plant is to remain in operation for a reasonable period of time. Zinc processing and refining in our Montana Operations are currently scheduled to be discontinued by midyear 1972. We have been unable to find an outlet for our East Helena product independent of the Great Falls Refinery.

We are informed that our furnace tapping and charging emission does not comply with a Ringlemon #2 equivalent opacity chart. To our knowledge, there is not a case in court against similar processes and effluents and, in our opinion, operating under a variance would not create a nuisance. We are not presently operating under a permit issued by the Board of Health.

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It is our desire to be in compliance with the visible emission standard adopted by the State of Montana. Within a few months we will have technical direction as to how this can be accomplished at East Helena. However, funding for controls plus a depressed metals market seriously jeopardizes our zinc operations and additional major expenditures in this area may not be possible.

Thank you.

THE ANACONDA COMPANY
25 BROADWAY, NEW YORK, N.Y. 10004

OFFICE OF THE VICE PRESIDENT
ENGINEERING AND PRIMARY PRODUCTION

June 13, 1968

American Chemet Corporation
105 West Madison Street
Chicago, Illinois 60602

Attention: Mr. W. W. Shropshire, President

Gentlemen:

This letter sets forth the agreement between THE ANACONDA COMPANY (hereinafter called "Anaconda") and AMERICAN CHEMET CORPORATION (hereinafter called "Chemet") as follows:

1. PURCHASE AND SALE

Subject to the terms and conditions of this Agreement, Anaconda shall sell to Chemet, and Chemet shall purchase from Anaconda and accept for settlement pursuant to paragraph 5 hereof, Chemet's monthly requirements of the screened fraction from Anaconda's Williams Mill (hereinafter called "Williams Mill Product") up to a maximum of 150 dry short tons per month.

2. TERM

This Agreement shall be in effect during the period June 1, 1968 through May 31, 1969 and shall continue thereafter unless cancelled by either party giving not less than 30 days' prior written notice.

3. QUALITY

The Williams Mill Product shall assay not less than 90.0% zinc and shall consist of all material passing through a number 10 mesh screen and remaining on a number 35 mesh screen.

4. DELIVERY AND LOADING

(a) Anaconda shall deliver the Williams Mill Product to Chemet, f.o.b. Black Eagle, Montana, in covered, hopper-bottomed cars.

(b) The cost of special loading shall be for Chemet's account.

5. PURCHASE PRICE

Chemet shall pay Anaconda for the Williams Mill Product delivered hereunder an amount equal to the price for 100% of the zinc contained in the Williams Mill Product, as determined by wet assay, such price to be $0.118 per pound when the price for Prime Western zinc at East St. Louis for the month that the Williams Mill Product is delivered is $0.125. Add or subtract $0.009 per pound for each $0.01 the price for Prime Western zinc is above or below $0.125 per pound.

The price quotations for zinc referred to in this paragraph 5 shall be those published by the Engineering and Mining Journal. In the event that the daily quotations by the Engineering and Mining Journal shall be discontinued or suspended or in the event that the basis for determining such quotations shall be changed, the parties shall substitute an alternate method of determining such metal prices that is fair and reasonable in the circumstances.

6. SETTLEMENT

Settlements under this Agreement shall be made at Anaconda's office at Great Falls, Montana, not later than 30 days after the end of each month in which the Williams Mill Product is delivered.

7. WEIGHING, SAMPLING AND ASSAYING

Railroad weights at East Helena shall govern for all purposes hereunder. Anaconda shall sample the Williams Mill Product and determine the moisture content thereof when it is loaded at Great Falls, Montana, in accordance with standard practices. At least three sample portions shall be made from each sample, one of which shall be delivered to Chemet, one of which shall be retained for use by Anaconda and one of which shall be sealed and retained by Anaconda for use by an umpire if necessary. Chemet and Anaconda each shall assay its sample portion for zinc content, and the results of such assay shall

be exchanged promptly by crossing in the mail or by personal delivery. If the zinc assays of the parties do not differ by more than 0.5%, the average of such assays shall govern for all purposes hereunder. If any such assay differs by more than 0.5%, another assay shall be made by each party from its sample portion and the average of such reassays (if they do not differ by more than 0.5%) shall govern for all purposes hereunder. If such reassays differ by more than the applicable splitting limit, they shall be disregarded and an assay shall be made from the umpire sample portion by an umpire assayer acceptable to both parties. In such event, the umpire assay (if it falls between the original assays of the parties) or the original assay of the party nearer that of the umpire (if the umpire assay does not fall between the original assays of the parties) shall be the accepted assay and shall govern for all purposes hereunder. The cost of the umpire assay shall be borne by the party whose original assay is further from that of the umpire.

8. FORCE MAJEURE

Should either party be prevented from or delayed in the performance of its obligations hereunder by reason of act of God, force majeure, breakdown or destruction of plant or equipment, shortage of or inability to secure fuel, power, materials or labor, delay in or shortage of transportation, labor difficulties, governmental acts or regulations, or any other contingency whether or not of the character or nature hereinbefore specifically enumerated which is beyond the control of the party affected and from which that party cannot reasonably relieve itself by giving security or otherwise, such party shall be excused from such performance during the continuance of such contingency and shall not be liable to the other for damages on account thereof.

9. DEFINITIONS

As used in this Agreement a "ton" means a dry short ton of 2,000 pounds avoirdupois.

10. GENERAL

(a) Any notice or other communication required or

permitted to be given pursuant to this Agreement shall be in writing and shall be sufficiently given if deposited in the United States mail (registered or first class), postage prepaid, addressed to the party intended as the recipient at its address first above set forth or to such other address as such party shall have specified in a notice given to the sender as provided in this paragraph 10(a).

(b) No right or obligation of either party under this Agreement is assignable without the prior consent of the other, and any purported assignment without such consent shall be void.

If the foregoing sets forth the agreement between us, please so indicate by signing the enclosed copy of this letter in the place indicated and sending it to the undersigned at the above address, thereby consitituting this letter an agreement between us.

Yours very truly,

THE ANACONDA COMPANY

By /s/ John G. Hall
Senior Vice President

CONFIRMED: June 28, 1968

AMERICAN CHEMET CORPORATION

By /s/ L. H. Larison
President

JGH:TKG:jh